

## Chapter 1

1-1.1-2

for me!!

· RStudio is required. (User friendly, easier to use)

## 1-3 Basic Arithmetic &amp; Coding

· Assign value: use "=" or "<="

e.g.

&gt; x = 11

&gt; print(x)

[1] 11

&gt; x

[1] 11

either is  
fine

&gt; y &lt;= 7

&gt; y

[1] 7

\* y 是 Numeric

if

&gt; y &lt;= 7L

这样 y 才是 Int.

\*

x does not equal to X

· ls(): return all object names.

e.g.

&gt; x &lt;= 11

&gt; y &lt;= 7

&gt; ls()

[1] "x" "y"

→ 適合自动化时使用

① rm(list = c("x", "y"))

相同: rm(x, y)

② rm(list = ls()) 移除所有变量

· rm(x): delete x = remove(x)

· Variable can be x, x.1, but not 2x

· Char.

\* 可用 class(x) 知道 type

e.g.

&gt; x = "11"

char not num.

&gt; class(x)

[1] "character"

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### • Several calculation

> x + y	> y^z	> exp(y)
> x - y	> sqrt(y)	> log2(y)
> x * y	> y^(1/z)	> abs(-14)
> x / y	> log(y)	

### • Incomplete command

e.g.

> sqrt(y)

⊕ will follow with a "+" \*escape 可跳出

### • ▲ : last command

### • Use # as comment

## 1-4 Vectors & Matrices:

### • Vectors : c( , , ) \*C: concatenate

e.g.

> x1 ← c(1, 3, 5, 7, 9)

> gender ← c("male", "female")

> x1

> gender

[1] 1 3 5 7 9

[1] "male" "female"

### • Sequence

e.g. > 2:7

> seq(from=1, to=7, by=1)

[1] 2 3 4 5 6 7

[1] 1 2 3 4 5 6 7

• Repeat

e.g. `> rep(1, times=10)` `> rep(1:2, times=3)`

`[1] 1 1 1 1 1 1 1 1 1 1` `[1] 1 2 1 2 1 2`

\* Can use `rep(seg( ~ ))`, `rep(c( ~ ))`

• If two vectors with same length, can add/sub/mult/div.

e.g. `> x <- c(1, 2, 3, 4)` \*也可以是 `> x <- 1:4`

`> y <- c(5, 6, 7, 8)`

`> x + y`

`> x * y`

`[1] 6 8 10 12`

`[1] 5 12 21 32`

• Vector: Include/Exclude

e.g. `> y <- c(1, 3, 5, 7, 9)`

`> y[3]` (The third one)

`> y[-3]` (Except the third one)

`[1] 5`

`[1] 1 3 7 9`

`> y[1:3]`

`> y[y < 6]`

`[1] 1 3 5`

`[1] 1 3 5`

`> y[c(1, 5)]`

`> y[-c(1, 5)]`

`[1] 1 9`

`[1] 3 5 7`



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Matrix:  $(c(\sim), \overset{nrow}{nrow} = ?, byrow = TRUE/FALSE)$

e.g. `> matrix(c(1,2,3,4), nrow=2, byrow=TRUE)`

[,1] [,2]

[,1]: 第一行

[1,] 1 2

[1]: 第一个位置

[2,] 3 4

`> matrix(c(1,2,3,4), nrow=2, byrow=FALSE)`

[,1] [,2]

[1,] 1 3

[2,] 2 4

`> mat <- matrix(1:9, nrow=3, byrow=TRUE)`

$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$

`> matR,C[1,2]`

`> mat[c(1,3),2]`

[1] 2

[1] 2 8

`> mat[2,]` (All Value in R2)

`> mat[,1]`

[1] 4 5 6

[1] 1 4 7

`> mat * 10`

`> length(mat)`

$\begin{pmatrix} 10 & 20 & 30 \\ 40 & 50 & 60 \\ 70 & 80 & 90 \end{pmatrix}$

[1] 9 (元素总量)

`> class(mat)`

[1] "matrix" "array"

`> matSub <- mat[2:3, 1:2]`

`> matSub`

[,1] [,2]

[1,] 2 3

[2,] 5 6

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```
> aa <- data.frame(nickname=c("John", "Mary", "Leo"), weight=60:62,  
  Height=c(160, 170, 180))
```

```
> aa
```

	nickname	weight	Height
1	John	60	160
2	Mary	61	170
3	Leo	62	180

\* matrix 会有 , data frame 无。  
[1,]  
[2,]

```
> class(aa)
```

```
[1] "data.frame"
```

```
* > View(aa)
```

→ 叫出 aa 的图表

## 1-5 Import/Copy Data from Excel to R (CSV, TXT)

· CSV ① 先将 excel 存成 .csv 档

e.g. 方法一

```
> data1 <- read.csv(file.choose(), header = TRUE) *click Enter
```

```
> data1
```

→ choose file

```
1 0 0
2 0 0
3 0 0
4 0 0
5 0 0
```

e.g. 方法二

```
> data2 <- read.table(file.choose(), header = TRUE, sep = ",")
```

ditto

:

· TXT

e.g. 方法一

```
> data3 <- read.delim(file.choose(), header = T)
```

ditto

:

e.g. 方法二

```
> data4 <- read.table(file.choose(), header = T, sep = "\t") tab.
```

ditto

:



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## 1-5b Import/Read Excel Data into R using RStudio (readxl)

(can import .xlsx & .xls)

File → Import Dataset → from Excel → Browse

\* 調整 Import Options

\* 調整 Data Preview (char, Int, skip, etc)  
內容 type

\* Code Preview = Copy Code

↳ File → New File → R Script → Run

## 1-6 Export Data from R

The most flexible command for exporting data from R is

write.table

e.g.

write.table(data2, file = "Data2.csv", sep = ",")

data want to export      file name      同理可改爲 .txt "t"

write.table(data2, file = "Data2.csv", row.names = F, sep = ",")

有 F 皆可

can change to csv  
→ no need for sep = ","

若已有此名稱檔  
會自動取代。

不會有第一行文字

↳ 也可以寫 col.name = F

write.table(data2, file = "/Users/.../Data2.csv", sep = ",")

including file path

→ save in a different working directory

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## 1-7 Import / Check / Work with Data in R

• See Dimensions (row/column) / Part of Data

e.g. `> dim(data2)`

[1] 10 1  
row col.

e.g.

`> head(data2)`

`> tail(data2)`

1  
2  
3  
4  
5  
6

5  
6  
7  
8  
9  
10

first 6 rows

last 6 rows

e.g.

`> data2[5:7, ]`

`> data2[-2:9, ]`

5  
6  
7

1  
10

e.g.

`names(data2)`

[1] "data2", "Age", "Height" (variables in data2)



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## 1-8 Variables & Data In R

• `Names()` : variables in the data

e.g.

```
> names(DataX)
```

```
[1] "Smoke" "Age" "Height" "Gender"
```

• Mean

e.g.

```
> mean(DataX$Age)
```

```
[1] 12.3269
```

\* 直接写 Age : Not found

需写 DataX\$Age

⇓

方法 = (attach the data) ↔ 可以省略

```
> attach(DataX)
```

```
> detach(DataX)
```

```
> mean(Age)
```

```
> Age
```

```
[1] 12.3269
```

```
> Not found
```

• `Levels()` : categories in variables

e.g.

```
> levels(DataX$Gender)
```

```
[1] "female" "male"
```

\* `> class(DataX$Gender)`

```
[1] "factor"
```

• `Summary()`

e.g.

```
① > x <- c(0,1,1,1,0,0,0,0,0,0) > summary(x)
```

```
> class(x)
```

```
> "numeric"
```

Min.	1st Qu	Median	Mean	Q3	Max
------	--------	--------	------	----	-----

0.00	0.00	0.00	0.3	0.75	1.00
------	------	------	-----	------	------

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```
② > X <- as.factor(x) > summary(x)
```

```
> class(x) 0 1
```

```
[1] "factor" 1 3
```

## 1-9 Subset (Sort/Select) Data In R with Square Brackets

### - Review Previous Sessions

```
> attach(DataX)
```

```
> Age[11:14]
```

```
[1] 19 17 12 10
```

```
> DataX[11:14, ]
```

```
- Age Height ...
```

```
11
```

```
12
```

```
13
```

```
14
```

### - Subset

```
e.g. > mean(Age[Gender == "female"])
```

```
[1] 12.44972
```

```
e.g.
```

```
> FemData <- DataX[Gender == "female", ]
```

```
> MaleOver15 <- DataX[Gender == "male" & Age > 15, ]
```

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## 1-10 Logic statements (T/F), cbind & rbind Functions in R

### Logic statements

e.g.

```
> Age [1:5]
```

```
[1] 6 18 16 14 5
```

```
> temp < Age > 15
```

```
> temp [1:5]
```

```
[1] F T T F F
```

```
> temp2 <- as.numeric(Age > 15)
```

```
> temp2 [1:5]
```

```
[1] 0 1 1 0 0
```

e.g. cbind (FemSmoke <- Gender == "female" & Smoke == "yes")

```
> MoreData <- cbind (DataX, FemSmoke)
```

```
> More [1:5,]
```

	DataX	Age	Height	...	FemSmoke
1					F
2					T
3					F
4					F
5					F



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## 1-11 Set up Working Directory in R

• find out current working directory

> getwd()

[1] "/Users/..."

• set wd

① full path

> setwd("/Users/.../Project1")

② tilde

> setwd("~/Desktop/Project1")

③

> projectWD <- "/Users/.../Desktop/Project1"

> setwd(projectWD)

④ Tools → Global → set WD

• save.image() = save my current workspace

e.g.

> save.image("FirstProject.Rdata")

or { workspace  
session } → save workspace as

• load() = load previous workspace image

e.g.

> load("FirstProject.Rdata")

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## 1-12 Writing Scripts in R

- Create new script / Open

File → New → R script / File → Open File

- Tab: return options

- Save

File → Save (as)

## 1-13 Install Packages in R

- `install.packages()` if know package name

eg. `> install.packages("epiR")`

...

Selection: 12 (choose a number)

eg.

`> install.packages()`

`> remove.packages("epiR")`

Loading Tcl/Tk interface ... done

↳ R will return menu of all packages available

- `library()`: use all function in the package

eg. `> library(epiR)`

↳ will disappear when ending the R session

# [www.r-project.org](http://www.r-project.org) . CRAN

↳ find all packages on this website

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## 1-14 Customizing the Look of R

### Tools

e.g. Appearance = Font size, Editor theme

Pane Layout

Packages = CRAN mirror



2021/10/15 上課筆記

· list ( )

&gt; dd &lt;- list("gwe", 590, "zzz") &gt; ff &lt;- list(dd, c(1,2,3))

&gt; dd

&gt; ff

[[1]]

[[1]]

[1] "gwe"

[[1]][1]

[[2]]

[1] "gwe"

[1] 590

: ditto

[[3]]

[1] "zzz"

· for 迴圈

&gt; for (i in 3:7) {

&gt; yy &lt;- matrix(NA, nrow=6, ncol=2)

for (j in 6:9) {

&gt; for (j in 1:2) {

print(c(i,j))

for (i in 1:6) {

}

yy[i,j] &lt;- i+4+(j-1)\*6

}

}

[1] -3 6

}

[1] ditto

&gt; yy

[,1] [,2]

(1,) 5 11

(2,) 6 12

: 7 13

; 8 14

9 15

10 16

No:

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· str-split ( )

> kk <- "abcdefghijk"

> pp <- str-split(kk, "e") #使用 stringr 套件

> pp

[1]

↓ 如果要以2個以上的字母為切分,

[1] "abcd" "fgh" "ijk" 可以將 "e" 改為 "d|h" 或是 "[dh]"

> class(pp) 則 pp: "abc" "efg" "eijk"

[1] "list"

>

> jj <- str-split(kk, "")

> jj

[1]

[1] "a" "b" ... "k"

>

> kk <- "John Wang"

> yy <- str-split(kk, " ")

> zz <- paste0("Mary ", yy[[1]][2])

> zz

[1] Mary Wang

· pdf-text ( ) #使用 pdf tools 套件

"/" 一定要

> pdfText <- pdf-text(paste0(getwd(), "/ 檔案.pdf"))

↳ 取 pdf 裡內容

> text1 <- pdfText[1] (page1)

> post1

> post1 <- str-locate(text1, "發文字號")

start end

[1,] 44 47

No: \_\_\_\_\_

Date: \_\_\_\_\_ / \_\_\_\_\_

```
> post2 <- str_locate(text1, "章分院每110...")
```

```
> post3 <- str_locate(text1, "主旨")
```

```
> post2
```

```
> post3
```

```
start end
```

```
start end
```

```
[1,] 49 64
```

```
[1,] 67 68
```

```
>
```

```
> str_sub(text1, startpost[1,2]+2, endpost3[1,1]-3)
```

```
[1] "章分院... 683族"
```

```
>
```

變成 post2 start & end 數字

```
> wantedString <- str_sub(text1, post[1,2]+2, post3[1,1]-3)
```

```
> file.rename("1.pdf", paste0(wantedString, ".pdf"))
```

原

新檔名

```
- allFiles <- list.files(getwd(), full.names = F)
```

↳ 顯示所有在 working directory 裡的檔名